India and China's Growth Spillover in Asia: A Spatial Panel Econometric Approach

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Abstract: The study estimates the extent of spillover effect that India and China's real per capita GDP growth rate has on the growth rates of other countries in Asia for the time period 2003-2016, using QML estimation methods. Different model specifications with spatial lag, spatial error and spatial Durbin terms indicate that a one percentage point increase in China's growth rate translates into 0.37-0.40 percentage points increase in the growth rates of other countries, considerably smaller than the estimate provided by fixed effects regression without spatial terms. However, this growth transmission does not occur through the conventional trade channel. On the other hand, India does not exert significant spillover effect on other countries in the region.

Keywords: QMLE, spatial panel data, spillover effect

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1. Introduction

In this globalized word, trade has become indispensable for the growth of any economy. In most nations, trade occurs between nations that are geographically close to each other, while in certain economies the pattern of trade is based on the principle of comparative advantage. Additionally, there have also been economic unions and trade agreements among nations to foster trade and growth as a symbiotic relationship. Vamvakidas (2000) studied the relationship between trade openness and growth, and infers that the positive relationship has spurred only in recent years. Grossman and Helpman (1991) studied the relationship between trade and growth through the lens of knowledge spillover. Comparing local knowledge to a public good, knowledge can be easily transferred and hence there is a possibility of innovation and technological spillover among trading nations.

Convergence has always been a very important issue for most developing economies all around the world. It is postulated that the poorer economies catch up faster than the developed economies, which in the long run helps to reduce inequality. At present, India is the fastest growing nation within the SAARC, growing at a rate of almost 7 percent year on year. The average growth rate of the South Asian nations has been close to 7 percent[3] over the last 20 years which is twice the global average, and over three times that of the EU economy. The South East Asian nations have also enjoyed commendable growth rates over the last decade and a half, except for a slowdown during the years following the Asian financial crisis.

[3] Source: World Bank database

Trade is considered to be a very important engine for growth, and major reductions in tariffs lead to liberalization of trade leading to growth. Trade openness among the SAARC and ASEAN nations has always been one of the top priorities for economic development. While Singapore and Maldives have high trade dependency, and hence a high trade-GDP ratio, a country like India has a huge domestic sector, and hence has a moderate level of trade to GDP ratio.

The story of growth spillover will be incomplete without the story of China. According to the International Monetary Fund, China's average growth rate over the past 10 years has been close to 10%, and has the largest purchasing power parity. As compared to a meager 8 percentage contribution to global growth, China today has been contributing an average of 31 percent from 2010-2013[4]. While the rapid growth can have a positive spillover on the growth of other countries, on the contrary, the slowdown in China's economy can prove to be detrimental for neighboring countries too.

In this paper, we study the leverage effect of India's and China's growth on the growth of other nations in South and South East Asia predominantly. Using a panel data model over a period of 2003-2016, the study uses QML and bias corrected QML estimation methods to analyze the effect of certain macroeconomic variables such as population growth rate, investment, government consumption, trade and a host of other factors on per capita growth of the concerned countries. Estimating the same model specifications as earlier but for a smaller time period, we infer where there is any difference between the usual QMLE and bias-corrected QMLE estimates of the spatial terms and their corresponding t-ratios.

[4] World Bank Growth Statistics

The remaining part of the paper has been organized in the following manner. Section 2 is a discourse on the related literature in spillover effects and spatial econometrics. Section 3 discusses the methodology used to analyze the data while Section 4 analyzes the data in greater detail. Section 5 presents the results of the study and Section 6 concludes the findings. The limitations of our study and the scope for future research are discussed in Section 7 at the end of the paper.

2. Literature Review

The study focuses on the spillover effect of India's growth on the SAARC nations and the South East Asian countries. In particular, the study also attempts to identify whether the growth transmission occurs through the conventional trade channel. The extent of spillover among nations has always been an area of considerable interest. In a world that has been witness to increased trade flows and financial linkages resulting in greater integration within and across economies, the need to estimate spillover effects of growth using spatial econometrics is of paramount importance. Though spatial econometrics has been employed to explain spillover in regional growth, the econometric methods in this rapidly evolving field have not been extensively used to explain spillover across countries.

Vaya *et al.* (2004) studied the role of externalities across regional economies in growth. Taking a simple growth model, the paper deduces that the growth rate of a region is positively related to the capital stocks of its neighbours. Magrini (2004) stresses on the fact that regional convergence and cross country convergence is separate and therefore, different empirical methods should be used to verify them. Fischer & Stirbock(2004) adopts a spatial econometric perspective to look into the regional convergence of per capita income in Europe from 1995-2000.

Rey and Janikas (2005) use spatial econometric literature to study the concept of regional income inequality and regional convergence. Fingleton and Lopez-Bazo (2006) use spatial econometrics tools to identify the presence of externalities between economies and estimate their magnitude using structural growth models. They explicitly model externalities caused by technological diffusion, as compared to previous studies that treat them in ad hoc manner and estimate their effects in the real world, using spatial error models. Ertur and Koch (2007) studied a theoretical growth model to estimate the impact of technological interdependent across economies. Technological interdependence is assumed to go through the route of spatial externalities. The paper confirms that geographical distance is a crucial variable to estimating interdependence across nations LeSage and Fischer (2008) suggest ways to specify spatial regression models and estimate them for regional growth analysis. According to them, though the effect of initial income levels wanes over time, own region and neighbouring region characteristics, strength of spatial dependence between the units involved and the spatial connectivity structure of the region are important determinants of long run regional income levels. Ahmed (2009) uses district level data on Pakistan for the time period 1970-2007 to determine the temporal effect of distance and contiguity on regional growth inequalities and human capital characteristics.

Convergence has been one major issue that has been discussed in depth with regard to trading partners and neighbouring economies. Convergence on per capita income is based on a host of economic and non-economic factors. While technology is one indispensable factor to fasten convergence across economies, trade openness is another vital factor in understanding how the convergence process takes place. Market failure and low quality of governance can also lead to delayed convergence. Hayami (1997) demonstrates, with cross-country comparisons and historical data, that country-specific factors such as governance, institutions and culture play a dominant role in determining the growth path of a country. In another study, Chua (1993) estimated the difference in convergence rates between and within regions. The study infers that the convergence rate within regions is on an average 0.5 percent higher than inter region convergence. This is mostly because of the fact that regions with similar income and ethnographic profiles are clustered, and hence convergence takes longer when the income differential is higher. Another major finding from the paper is that convergence depends not only on domestic investment rate, but also on investment made by the foreign country. In a spatial setting, Egger and Pfaffermayr (2006) used the data on GDP per capita of European regions to analyze the consequences of spatial interdependence for convergence in a Solow growth model. The rate of convergence of a region was observed to depend on its location and the effects could be further disintegrated into the remoteness effect, actual speed of convergence and the impact of the initial gap.

Coe and Helpman (1995) studied the impact of spillovers due to innovation in research and development. Studying the effect of domestic and foreign countries' R&D stock on total factor productivity, the paper concluded that foreign R&D capital stocks have in particular large effects on the smaller economies. Zhang and Felmingham (2002) studied the reasons for intra-regional spill over in China during the years 1984 to 1988. The major reasons cited in the study for the spillover effect were inward foreign direct investment, export expansion and domestic investment. Additionally, the study also concluded that for Western China, which is more labor intensive, labor expansion has a positive effect on growth.

Arora and Vamvakidis (2005) studied the spillover effects of South Africa on other African countries for the time period 1960-99. The study discusses how growth in South Africa is significant to the growth of other countries in Sub-Saharan Africa. The paper also tests for robustness results by checking for a different time period, and using time fixed effects. Another study by Obiora (2009) analyzed the spill over effect of the European Union (EU) and Russia towards the Baltic countries. Using a Vector Auto Regression Model (VAR), the study shows how the most important linkages for growth spill over were mostly through trade linkages and financial conditions. In particular, the EU had a greater impact on the Baltic countries than Russia.

Keeping in mind the literature that has been covered in this broad area, the paper sheds light on the spill over effect of India's growth on the South and South East Asian economies during the period of 2003-2016.

Shan & Sun (1998) discuss the export led strategy for growth in case of China. The paper empirically tests the relation between China's exports on its growth using a Vector Auto regression framework. The study concludes that there exists a bi-directional causality between exports and industrial output.

Herrero & Santabarbara (2004) estimates the effect of China's foreign direct investment on Latin American countries. The study revealed that during the time period of 1995 – 2001, increase imports by China had hampered the growth of Mexico and Columbia. The paper predicts that increased inward investment by China may have a two-sided effect on the Latin American countries having similar structure.

Eichengreen and Tong (2006) discusses the effect of China's growth on the export of the Asian nations. Using the gravity model, the paper discusses how China's growth has caused a crowding out effect on lesser developed Asian economies that export consumer goods, while simultaneously China's high import of capital goods has a positive impact on more developed Asian nations.

Arora and Vamvakidis (2010) employed the VAR and error correction models to estimate the effect of China's growth on other economies. Their research shows that China's growth has a spillover effect both in the long term as well as in the short term, and states that the importance of distance between its neighbours have decreased over time.

3. Methodology

The empirical framework that has been employed in the paper follows the standard literature on growth theory. The study estimates India and China's growth spillover effects on the Asian economies[5] for the time period 2003-2016, using a spatial econometric approach. The reason these economies were chosen is because complete data were available for the set of countries over our concerned time period. Thus the dependent variable in our study is per capita real GDP growth rate of the countries concerned while the independent variables are India and China's per capita real GDP growth rates (all variables being measured in constant 2010 US dollars). Since we are dealing with growth rates and not the variables in their level form, we do not need to worry about the problem of non-stationarity. We also include several other explanatory variables in the model, which can possibly account for economic growth in a country. The list of control variables includes:

- Convergence (logarithm of real per capita GDP in the initial year of the period under study)
- Demographics (annual population growth rate)
- Education (secondary school enrolment ratio)
- Investment (gross capital formation as a percentage of GDP)
- Inflation (annual percentage change in consumer prices)

[5] Afghanistan, Bangladesh, Bhutan, Brunei, Cambodia, Indonesia, Laos, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam, Japan, Hong Kong, Saudi Arabia, Iran, Iraq, Kuwait

- Government consumption (General government final consumption expenditure as a percentage of GDP)
- Trade openness (the sum of exports and imports of a country as a fraction of GDP)

In addition to the above regressors, we also include two interaction terms, one for India and the other for China to identify whether the growth transmission occurs through the trade channel.

- India's (China's) real per capita growth rate times its share in total trade of a country

Thus the baseline model is the following:

Real per capita GDP growth rate$_{it}$ = β_1Convergence$_i$ + β_2Population growth rate$_{it}$+ β_3Education$_{it}$ + β_4Investment$_{it}$ + β_5Investment$_{it}$ + β_6Government consumption$_{it}$ + β_7Trade$_{it}$ + β_8India's real per capita GDP growth rate$_{it}$ + β_9(India's real per capita GDP growth rate*Share of India in total trade)$_{it}$ + β_{10}China's real per capita GDP growth$_{it}$ + β_{11}(China's real per capita GDP growth rate*Share of China in total trade)+ u_{it}

We then perform spatial econometric analysis using the following model specifications, where W_n refers to the spatial weight matrix and μ_n and α_t are individual specific and time specific fixed effects respectively.

<u>Table 1: Model Specifications with Spatial Terms</u>

	Model Specification	Description
1	SLD (spatial lag)	$Y_{nt}= \lambda_0 W_n Y_{nt} + X_{nt}\beta + \mu_n + \alpha_t 1_n + u_{nt}$
2	SED (spatial error)	$Y_{nt}= X_{nt}\beta + \mu_n + \alpha_t 1_n + \rho_0 W_n u_{nt} + v_{nt}$
3	Durbin SLD	$Y_{nt}= \lambda_0 W_n Y_{nt} + X_{nt}\beta + \gamma W_n X_{nt} + \mu_n + \alpha_t 1_n + u_{nt}$
4	Durbin SED	$Y_{nt}= X_{nt}\beta + \gamma W_n X_{nt}+\mu_n + \alpha_t 1_n + \rho_0 W_n u_{nt} + v_{nt}$
5	SLE (spatial lag+ spatial error)	$Y_{nt}= \lambda_0 W_n Y_{nt} + X_{nt}\beta + \mu_n + \alpha_t 1_n +\rho_0 W_n u_{nt} + v_{nt}$

In an era of globalization where countries have made conscious efforts to open up, there ought to be spillover effects across economies. This spillover can place take directly through the growth channel or indirectly through trade and FDI. There may also be factors, not accounted for in my model, which may contribute to cross country growth. Such unobservable factors may result in significant spillovers across economies. Thus the rationale to use the above model specifications is on a firm footing. We can also potentially estimate a model with all the spatial effects included, namely spatial lag, spatial error and spatial Durbin, but the literature suggests certain estimation issues for these model specifications. Hence we opt it out of our study.

W_{1n} and W_{2n} need not necessarily be the same weight matrices and they can be derived based on economic distance (whether two countries have an FTA signed between them) or physical distance. We adopt the latter approach, since weights based on economic distance are time-varying and are beyond the scope of our study. The spatial weight matrix is thus formed based on the latitude and longitude of a country and is row-normalized. To simplify the analysis, we use the same spatial weight matrix for spatial lag, spatial error and spatial Durbin terms.

We then estimate the above mentioned model specifications to obtain QMLE estimates.

4. Data

The time period of the study is 2003-2016. The data for economic indicators have been obtained from the World Bank[6] database while value for trade openness and volume of trade are available on the UNCTAD WITS[7] database.

For the economic indicator secondary school enrollment, there are missing data points for a majority of the countries. We have also been unable to obtain the same from other secondary sources. Hence data unavailability has led us to exclude secondary school enrollment as a control variable in the model specifications.

The trade data has been obtained from the UNCTAD-WITS database. However, it must be borne in mind that there are missing trade data for the smaller countries. In such a case, we had to obtain mirror data[8].

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[6] http://data.worldbank.org/

[7] http://wits.worldbank.org/

[8] While obtaining the volume of bilateral trade on UNCTAD WITS database, one needs to choose the reporting country, the partner country and type of trade flow. For example, while trying to obtain the value of Bhutan's exports to India, one must select Bhutan as the reporting country and India as the partner country and type of trade flow as exports. However, trade data is unavailable for Bhutan as the reporting country in recent years. Hence, to obtain mirror data, I choose India as the reporting country, Bhutan as the partner country and type of trade flow as imports.

For the weight matrix, the latitudinal and longitudinal coordinates have been obtained from a Google developers CSV file[9]. The percentage of non-zero weights in the spatial weight matrix equals 29.3%. The fact that the countries are similar with regards to their geographical location justifies the high percentage of non-zero elements in the spatial weight matrix.

The detailed summary statistics of all the variables and the correlation matrix of the explanatory variables (without spatial terms) in the study have been presented in Tables 2 and 3 of the Appendix respectively. The row-normalized spatial weight matrix is provided in Table 4 of the Appendix.

5. Results

To begin with, we conduct a pooled ordinary least squares regression without taking into account the panel dimension of the data (spatial terms are also ignored) (Column 1 of Table 5). The variables that prove to be significant are convergence, population growth rate, trade openness and China's growth rate. While convergence and population growth rates have negative coefficients, trade openness, as expected, is observed to have a positive coefficient. Interestingly, China's growth rate is statistically significant with a one percentage point increase in China's growth rate translating into an increase of 0.41 percentage points in the growth rates of other countries, on average. India's growth rate however is insignificant and neither of the growth transmissions occurs through the trade channel. We then take into account the panel dimension of the data and conduct panel regression analysis to estimate the baseline model, without any spatial term. Having run the Durbin-Wu-Hausman test, we

[9]https://developers.google.com/public-data/docs/canonical/countries_csv

reject the null hypothesis and conclude that the fixed effects model is consistent due to possible serial correlation between the error terms. The results of the fixed effects panel regression (column 2 of Table 5) show that China's per capita GDP growth rate has significant explanatory power for the growth rates of other countries. More precisely, a 1 percentage point increase in India's growth rate translates into a 0.58 percentage points increase in the growth rates of the countries concerned. However, the interaction term is not significant, which explains that growth transmission does not occur through the conventional trade channel.

The first two models do not include the spatial terms, and hence we strengthen the analysis further by analyzing the spatial terms to check if there is any spatial effect on the growth spillover between nations. The SLE model is estimated which includes the weight matrices for the dependent variable (growth), as an independent variable, and as well as the error terms. Column (3) in Table 5 indicates the QML estimates for the SLE model (spatial lag & spatial error). Though neither the spatial lag term nor the spatial error term is significant, China's growth rate has significant explanatory power for the growth rates of other countries in the region. However, the magnitude of spillover effect is smaller compared to the fixed effects model, with a 1 percentage point increase in China's GDP growth rate translating into 0.40 percentage point increase in the growth rates of other countries. Once again, as in the baseline model, transmission of growth does not occur through the trade channel. India's growth rate as well as the interaction term for India is not significant. The other variables that are significant in the SLE model are convergence, population growth, trade openness. Among these variables, only the coefficient for trade openness has a positive estimate. Hence, the SLE model concludes that there is no spatial interdependency with respect to growth or other unexplained terms in the model.

Column (4) and (5) reports the regression results for model specifications with spatial lag and spatial error terms respectively. The results are very similar to the previous findings, with none of the spatial terms being significant. However China's growth rate continues to have good explanatory power for the growth prospects of other countries in the region, with a slightly diminished effect. A one percentage point increase in China's growth rate translates into an increase of 0.37 percentage points increase in the growth rates of other countries, on average.

Finally, we incorporate spatial Durbin terms and obtain the QMLE estimates in both the SLD and SED model (Columns (6) and (7) of Table 5). While the Durban SLD model includes the weight matrices for the growth term, and then each of the independent variables, the Durban SLE model includes the weight matrices for the error term and each independent variable. The results are almost identical to the previous model specifications. Thus we observe that China's growth spillover effects are quite robust to the different model specifications. In the SLD model with Durbin terms, besides population growth rate, convergence and trade openness (as in previous models), the spatial Durbin terms that are significant are government consumption and inflation. Both variables have negative coefficient estimates, which essentially mean that inflation and government consumption have negative spatial effects.

6. <u>Conclusion</u>

A spatial panel regression analysis in estimating India and China's growth spillover effects on countries in Asia yields more accurate results than estimates derived from a simple fixed effects panel regression. In a period of globalization, where nations have opened up their borders to increased trade and FDI flows, physical as well as economic distance play a defining role in estimating the magnitude of spillover effects of one country on another. Since weights based on economic distance may change over time, the spatial weight matrix has been derived based on latitudinal and longitudinal coordinates of the countries.

Various model specifications with spatial lag, spatial error and spatial Durbin terms have been tested for the time period 2003-2016. The results are quite robust when analysis is conducted for the different model specifications. While a fixed effects panel regression estimates that a one percentage point increase in China's growth rate translates into 0.58 percentage point increase in growth rates of the other countries, the effects are diminished when we incorporate the spatial dimension into our model. This is because the spatial terms control for the unobserved channels through which economic indicators and policy variables affect a country's neighbors. Spatial analysis reveals that a one percentage point increase in the growth rate of China translates into 0.37-0.40 percentage points increase in the growth rates of other countries. India, on the other hand, has no significant spillover effects of growth on other countries in the region. However, for both India and China the growth transmission does not occur through the conventional trade channel, either due to low levels of intra-regional trade or the fact that India and China are still moderately closed economies. The other explanatory variables that are significant in explaining the growth of an economy are convergence, population growth rate and trade openness. Since most of the economies in the region are densely populated, population growth rate has a negative coefficient estimate and acts as a restraint on the growth prospects of a nation. Convergence, according to standard literature on growth theory, has a negative coefficient estimate, while trade openness has a positive coefficient estimate.

Thus, in conclusion though China exerts significant spillover effects in growth on other countries in Asia, the growth transmission does not occur through the conventional trade channel. One of the channels through which the spillover can occur is foreign direct investment. On the other hand, India fails to generate any spillover effect on other countries in Asia.

7. **Limitations and Future Scope of Research**

To further identify the channel through which spillover occurs, one can look into the role of financial linkages. This could be either in the form of foreign direct investment or remittances, which are generally considered to be high in the region.

One can also ponder over suitable choice of a weight matrix. The rationale behind constructing a weight matrix based on physical distance is based on the fact that economic distances generally vary over time. However, latitudinal and longitudinal coordinates do not account for the closeness of ties between economies. A more suitable weight matrix can be constructed based on the average value of bilateral trade between two countries, which will mimic the economic distance between two economies more accurately

7. **References**

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Appendix

Table 2: Summary Statistics of the Variables

Variable	Number of Observations	Mean	Standard Deviation	Skewness	Kurtosis
Real per capita GDP growth rate (dependent variable)	294	3.38	3.63	1.13	37.74
Convergence	294	10904.65	14935.99	1.19	2.73
Population growth rate (annual %)	294	1.68	1.14	1.48	6.68
Investment (% of GDP)	210	26.14	9.08	1.54	7.033
Inflation (consumer prices annual %)	294	5.91	7.03	2.45	13.9
Government Consumption (% of	294	12.71	5.47	0.64	2.62

GDP)					
Trade openness (% of GDP)	294	92.99	83.04	2.11	6.93
India's real per capita GDP growth rate	294	6.216	1.611	-0.664	3.234
Share of India in trade * India's real per capita GDP growth rate	294	0.646	1.27	2.98	11.2
China's real per capita GDP growth rate	294	8.988	0.1216	0.555	-0.29
Share of China in trade * China's real per capita GDP growth rate	294	1.17	0.86	2.17	7.35

Table 3: Correlation Matrix of Explanatory Variable

	Convergence	Population growth rate	Investment (% of GDP)	Inflation consumer prices (annual %)	Government Consumption (% of GDP)	Trade openness (% of GDP)	India real per capita GDP growth rate	Interaction Term	China real per capita GDP growth rate	Interaction Term (China)
Convergence	1.000									
Population growth rate (annual %)	0.102	1.000								
Investment (% of GDP)	-0.22	-0.21	1.000							
Inflation (consumer prices annual%)	-0.340	0.08	0.092	1.0000						
Government Consumption (% of GDP)	0.4725	0.201	0.678	-0.202	1.000					
Trade openness (% of GDP)	0.324	-0.07	-0.072	-0.195	-0.165	1.000				
India's real per capita GDP growth rate	0.0000	-0.017	-0.036	-0.177	0.018	-.006	1.000			
Interaction Term	-0.215	0.032	0.589	0.046	0.153	-0.155	0.120	1.000		
China's real per capita GDP growth rate	0.000	0.048	-0.114	0.114	-0.087	0.041	0.477	0.03	1.00	
Interaction Term	0.082	-0.403	-0.058	-0.052	-0.339	0.447	0.084	-0.177	0.065	1.00

(China)										

Table 4: Weight Matrix

	AFG	BGD	BTN	BRN	KHM	IDN	LAO	MYS	NPL	PAK	PHL	SGP	LKA	THA	VNM	JPN	HK	SAU	IRN	IRA	KUW
AFG	0	0	0.17	0	0	0	0	0	0.17	0.17	0	0	0	0	0	0.17	0	0	0.17	0.17	0

	AFG	BGD	BTN	BRN	KHM	IDN	LAO	MYS	NPL	PAK	PHL	SGP	LKA	THA	VNM	JPN	HK	SAU	IRN	IRA	KUW
BGD	0	0	0.2	0	0	0	0.2	0	0.2	0	0	0	0.2	0.2	0	0	0	0	0	0	0
BTN	0.2	0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0	0
BRN	0	0	0	0	0.17	0.17	0.00	0.17	0.00	0.00	0.17	0.17	0.00	0.00	0.17	0	0	0	0	0	0
KHM	0	0	0	0.2	0	0	0.2	0.2	0	0	0	0	0	0.2	0.2	0	0	0	0	0	0
IDN	0	0	0	0.25	0	0	0	0	0	0	0.25	0.25	0	0	0	0.25	0	0	0	0	0
LAO	0	0.17	0.17	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.17	0.00	0.17	0.00	0	0	0
MYS	0	0	0	0.2	0.2	0	0	0	0	0	0	0.2	0.2	0.2	0	0	0	0	0	0	0
NPL	0.2	0.2	0.2	0	0	0	0	0	0	0.2	0	0	0.2	0	0	0	0	0	0	0	0
PAK	0.2	0	0	0	0	0	0	0	0.2	0	0	0	0.2	0	0	0	0	0.2	0.2	0	0
PHL	0	0	0	0.2	0	0.2	0	0	0	0	0	0	0	0	0.2	0.2	0.2	0	0	0	0
SGP	0	0	0	0.25	0	0.25	0	0.25	0	0	0	0	0.25	0	0	0	0	0	0	0	0
LKA	0	0.14	0.00	0.00	0.00	0.00	0.00	0.14	0.14	0.14	0.00	0.14	0.00	0.14	0.00	0.00	0.00	0.14	0.00	0.00	0
THA	0	0.2	0	0	0.2	0	0.2	0.2	0	0	0	0	0.2	0	0	0	0	0	0	0	0
VNM	0	0	0	0.2	0.2	0	0.2	0	0	0	0.2	0	0	0	0	0	0.2	0	0	0	0
JPN	0.17	0.00	0.17	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.17	0.00
HK	0	0	0.2	0	0	0	0.2	0	0	0	0.2	0	0	0	0.2	0.2	0	0	0	0	0
SAU	0	0	0	0	0	0	0	0	0	0.2	0	0	0.2	0	0	0	0	0	0.2	0.2	0.2
IRN	0.2	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.2	0	0.2	0.2
IRA	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0.2	0.2	0	0.2
KUW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0.33	0.33	0

AFG: Afghanistan; BGD: Bangladesh; BTN: Bhutan; BRN: Brunei; KHM: Cambodia; IDN: Indonesia; LAO: Laos; MYS: Malaysia; NPL: Nepal; PAK: Pakistan; PHL: Philippines; SGP: Singapore; LKA: Sri Lanka; THA: Thailand; VNM: VietnamJPN: Japan; HK: Hong Kong; SAU: Saudi Arabia; IRN: Iran; IRQ: Iraq; KUW: Kuwait

Table 5: Pooled OLS, Fixed Effects, QML Estimates and t-ratios

	Pooled OLS (1)	**Fixed Effects (2)**	**SLE (3)**	**SLD (4)**	**SED (5)**	**D. SLD (6)**	**D. SED (7)**
SLD(λ)	-	-	-0.02 (-0.01)	0.13 (0.48)	-	0.18 (0.67)	-
SED(ρ)	-	-	0.21 (0.14)	-	0.2 (0.69)	-	0.21 (0.77)
Convergence	-0.00* (-4.65)	-	-0.00* (-3.71)	-0.0002 (-4.03)	-0.0002 (-4.08)	-0.0002 (-4.16)	-0.0002 (-4.22)
Population Growth	-0.73* (-2.54)	-1.96 (0.53)	-1.67* (-2.85)	-1.66 (-3.76)	-1.67 (-3.85)	-1.35 (-3.02)	-1.3 (-2.88)
Investment	-0.09	-0.03	-0.05	-0.04	-0.05	-0.06	-0.06

	Pooled OLS (1)	**Fixed Effects (2)**	**SLE (3)**	**SLD (4)**	**SED (5)**	**D. SLD (6)**	**D. SED (7)**
	(-0.21)	(-0.51)	(-0.94)	(-0.68)	(-0.93)	(-1.23)	(-1.04)
Inflation	-0.06 (-1.3)	-0.08 (-1.57)	-0.03 (-0.54)	-0.04 (-0.68)	-0.03 (-0.55)	-0.05 (-0.92)	-0.06 -1.04)
Government Consumption	0.06 (0.85)	0.54 (3.4)	0.13 (1.39)	0.11 (1.3)	0.13 (1.52)	0.15 (1.7)	0.14 (1.6)
Trade Openness	0.01* (2.35)	0.03 (1.55)	0.01* (2.06)	0.01 (1.9)	0.01 (2.08)	0.01 (2.26)	0.01 (2.2)
India	0.04 (0.2)	-0.17 (-0.78)	0.16 (0.57)	0.17 (0.74)	0.16 (0.69)	0.01 (0.05)	0.004 (0.02)
India Interaction	-0.06 (-0.22)	0.25 (0.33)	-0.18 (-0.44)	-0.14 (-0.34)	-0.18 (-0.45)	-0.2 (-0.49)	-0.18 (-0.42)
China	0.41* (2.59)	0.58* (3.4)	0.4* (2.17)	0.37 (2.1)	0.4 (2.23)	0.34 (1.83)	0.33 (1.73)
China Interaction	-0.48 (-1.15)	-0.02 (-0.02)	-0.52 (0.85)	-0.56 (-0.94)	-0.52 (-0.86)	-0.41 (-0.68)	-0.44 (-0.73)

	Pooled OLS (1)	**Fixed Effects (2)**	**SLE (3)**	**SLD (4)**	**SED (5)**	**D. SLD (6)**	**D. SED (7)**
WConv	-	-	-	-	-	0.0001 (0.8)	0.0001 0.6)
WPopgro	-	-	-	-	-	1.67 (1.39)	1.49 1.25)
WInv	-	-	-	-	-	0.08 (0.62)	0.09 0.64)
WInfla	-	-	-	-	-	-0.31 (-1.97)	-0.35 (-2.2)
WGovcon	-	-	-	-	-	-0.57 (-2.76)	-0.56 (-2.66)
WTrade	-	-	-	-	-	-0.03 -2.04	-0.03 -1.93
WIndia	-	-	-	-	-	-0.96 -1.24	-1.09 -1.34
WIndInt	-	-	-	-	-	0.66 0.68	0.63 0.61

	Pooled OLS (1)	Fixed Effects (2)	SLE (3)	SLD (4)	SED (5)	D. SLD (6)	D. SED (7)
WChina	-	-	-	-	-	-0.38 -0.79	-0.24 -0.5
WChiInt	-	-	-	-	-	-0.43 -0.33	-0.55 -0.41
Constant	1.51 0.69	-5.74 -1.59	-	-	-	-	-

*'W' indicates the spatial Durbin terms.